VEHICLE DETECTION SYSTEMS AND METHODS OF OPERATION THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation of PCT application no. PCT/US16/32529, filed on May 13, 2016, which claims the benefit of U.S. Provisional Application No. 62/162,574, filed on May 15, 2015. The above-identified patent applications are hereby incorporated by reference in their entireties.

TECHNICAL FIELD

[0002] This disclosure relates generally to the field of vehicle parking management and, more specifically, to vehicle detection systems and methods of operation thereof.

BACKGROUND

[0003] Parking a vehicle in densely populated environments is often a frustrating experience due to the dearth of free parking spaces and the expense of private parking garages or lots. This is especially true in populated urban environments such as the downtowns of large municipalities (e.g., New York City, San Francisco, etc.). Moreover, parking is often in demand near destinations or event venues such as neighborhoods surrounding sports stadiums, concert halls, amusement parks, or beachfronts.

[0004] Additionally, the high price of real estate has motivated many property owners to seek out non-traditional ways for property owners to monetize their real property assets. For example, homeowners can often rent out rooms in their homes to tourists or travelers using an online home rental platform.

[0005] Therefore, a solution is needed for a parking management system to conveniently, securely and effectively allow property owners to rent out their available parking space(s) and for drivers seeking parking to reserve such parking spaces. In addition, such a solution should assist the property owner in determining an appropriate rental price for their parking spaces. Also, such a solution should be able to assist the property owner in maximizing their earning potential from such assets by ensuring adequate turnover in parked vehicles and that empty parking spaces are occupied quickly and efficiently. Moreover, such a solution should also ensure that drivers vacate rented parking spaces in time so as not to inconvenience property owners who require such spaces and suggest appropriate penalty measures when drivers overstay their allotted parking times.

SUMMARY

[0006] A parking management system and methods of operation are disclosed. A computer-implemented method of managing parking reservations over a communications network can include receiving, in one or more databases stored in one or more memory units, positional data concerning a listing location. The method can also include establishing, using one or more processors of a computing system, a radius boundary based on the positional data stored in the one or more databases and filtering, using the one or more processors, the one or more databases using the radius boundary to determine an amount of parking spaces listed and the amount of parking spaces reserved within a preset time period. The method can also include calculating, using the one or more processors, a transaction rate using the amount of parking spaces listed, the amount of parking spaces reserved, and the preset time period and storing the transaction rate in the one or more databases. The method can also include determining, using the one or more processors, a recommended listing price based on the transaction rate and transmitting, over the communications network using one or more communication interfaces, the recommended listing price to a listing client device.

[0007] The method can also include receiving, over the communications network, one or more listing requests from one or more parking sensors. The method can also include receiving, over the communications network, one or more reservation requests from at least one of one or more booking client devices and one or more control units of a self-driving vehicle and updating, using the one or more processors, the amount of parking spaces listed and the amount of parking spaces reserved in the one or more databases using the one or more listing requests and the one or more reservation requests.

[0008] The one or more parking sensors can include a proximity detector, one or more sensor processors, a sensor communication interface, and a portable power supply. The one or more parking sensors can also include a positioning unit of a booking client device or the control unit of a self-driving vehicle.

[0009] The method can also include adding, using the one or more processors, a buffer period to a reservation period in response to receiving the reservation request from at least one of the booking client device and the control unit of the self-driving vehicle. The method can also include calculating, using the one or more processors, an average listing price based on listing prices stored in the one or more databases prior to determining the recommended listing price and determining, using the one or more processors, the recommended list price by calculating a listing multiplier using the transaction rate stored in the one or more databases and multiplying the listing multiplier by the average listing price.

[0010] The method can also include calculating the listing multiplier by applying, using the one or more processors, a logarithmic function to the transaction rate stored in the one or more databases when the transaction rate exceeds a rate threshold. The method can also include receiving timestamp data from one or more sensors in a vicinity of the listing location and storing the timestamp data in the one or more databases. The method can also include determining, using the one or more processors, an average park time using the timestamp data; and transmitting, over the communications network using the one or more communication interfaces, a recommended availability time calculated using the average park time to the listing client device. The one or more sensors can include a positioning unit of at least one of one or more booking client devices and one or more control units of a self-driving vehicle.

[0011] The method can also include receiving, over the communications network, a status update from a booking client device concerning an upcoming departure of a vehicle occupying a reserved parking space. The method can also include determining a real-time position of the booking client device in response to receiving the status update and querying a parking sensor in a vicinity of the reserved